precipitation was generally light, with large areas in the Great Plains States having less than 1 inch, and much of eastern and central Washington and Oregon less than one-half inch of precipitation.

SNOWFALL.

A much larger extent of the country was visited by snowstorms than is usual for October, the southern limit of snow extending well into the central portions from the Ohio Valley westward to the mountains of California. From the 18th to 20th unusually heavy snows occurred over much of the lower Missouri and upper Mississippi valleys, the fall being especially heavy in portions of Nebraska, Iowa, and Minnesota. In the western mountain districts snow was reported from nearly all portions and over large areas from Montana southward over Wyoming, Colorado, Utah, and Nevada the amounts were unusually large.

Warmer weather following the snowfall soon caused it to disappear and at the end of the month but little remained on the ground, except in the higher mountains.

RELATIVE HUMIDITY.

For the month as a whole the relative humidity throughout the Great Plains States and to the westward was generally above the normal, except in Washington, Oregon, and the extreme western portions of Idaho and Montana, where the weather for the month was drier than usual. On the other hand the month was relatively damper than the average in much of the Mississippi and Ohio Valleys, the Lake region, the eastern Gulf and the Middle Atlantic States, save in portions of the Carolinas and Georgia, where it was drier. In the southern portions of the New England and Middle Atlantic States the relative humidity for the month averaged near or slightly above the normal.

GENERAL SUMMARY.

Mild weather, little rain, and much sunshine gave conditions favorable for the maturing and harvesting of late crops in most central and eastern districts. The seeding of winter grains was delayed on account of lack of moisture during the early part of the month in nearly all sections of the country, particularly in the Mississippi Valley States. However, the rains which occurred during the latter half of the month made possible the carrying on of this work, and excellent progress was made except in parts of the south central, north central, and extreme eastern districts. Seasonable temperature and abundance of sunshine were favorable for picking cotton, and this work progressed in a very satisfactory manner. There was not enough rain for pastures in some eastern States, but in most sections the pastures and ranges were favorably affected by moisture, and stock is reported in good condition in most western districts. Rainy weather in California during the early part of the month, while a benefit to the citrus fruit and fall truck, did great damage to the raisin crop which was on the drying trays. The hard freezes of the 9th and 19th caused severe loss of apples on trees in the Bitterroot Valley, Montana.

SEVERE STORMS.

The following notes of severe storms have been extracted from reports from officials of the Weather Bureau:

Alabama.—A tropical storm moved from the Gulf of Mexico northward over western Alabama and eastern Mississippi on October 18, 1916. The passage of this storm was marked by unprecedented high winds in the coast and southeastern counties. The maximum velocity at Mobile was 115 miles an hour from the east at 8:25 a. m., which is the highest record for the State. The damage along the Gulf coast was remarkably slight, considering the velocity of the wind, and appears to have been greatest in Dale, Coffee, and Covington Counties, where much timber was blown down, several houses demolished, and at least two persons killed.

Florida.—A tropical storm passed over Pensacola, Fla., on October 18, 1916, where the wind reached an extreme velocity of 120 miles an hour at 10:13 a. m., when the wind instrument tower was blown down. Many buildings were unroofed or demolished, but the damage to shipping interests was comparatively small because of precautions taken. The total damage was estimated at about $100,000.

Average accumulated departures for October, 1916.

Districts.	Temperature.			Precipitation.			Cloudiness.		Relative humidity.	
	General mean for the current month.	Departure for the current month.	Accumulated departure since Jan. 1.	General mean for the current month.	Departure for the current month.	Accumulated departure since Jan. 1.	General mean for the current month.	Departure from the normal.	General mean for the current month.	Departure from the normal.
	°F.	°F.	°F.	In.	In.	In.	P. ct.		P. ct.	
New England	51.9	+1.5	− 4.3	1.79	−1.80	− 3.80	4.9	−0.5	77	− 2
Middle Atlantic	56.2	+0.5	+ 6.3	1.51	−1.70	− 4.70	4.2	−0.6	74	− 2
South Atlantic	64.5	+0.8	+ 9.2	3.20	−0.70	−10.20	4.8	+0.8	79	+ 1
Florida Peninsula	77.2	+0.8	− 1.8	3.06	−3.20	−13.10	4.9	+0.2	78	− 2
East Gulf	66.6	+1.0	+ 7.6	2.50	−0.30	− 1.20	3.2	−0.7	72	− 1
West Gulf	68.0	+1.3	+12.7	1.51	−1.30	− 5.80	3.0	−0.7	69	− 3
Ohio Valley and Tennessee	57.5	+0.9	+ 1.7	2.20	−0.30	− 0.60	3.8	−0.6	70	− 1
Lower Lakes	52.2	+0.5	+ 0.1	2.37	−0.90	− 2.10	4.9	−1.0	70	− 4
Upper Lakes	47.6	+0.1	+ 0.8	3.42	+0.60	+ 2.50	5.9	−0.1	76	− 2
North Dakota	40.5	−2.0	−17.6	0.47	−0.80	+ 0.10	5.7	+0.5	74	+ 2
Upper Mississippi Valley	53.2	+0.2	+ 3.0	2.27	−0.20	− 1.20	4.9	+0.3	72	+ 1
Missouri Valley	53.1	+4.1	+ 7.4	1.52	−0.40	− 5.90	4.4	+0.3	66	− 1
Northern slope	42.1	−2.6	−13.4	1.76	+0.50	+ 0.40	5.2	+0.8	68	+ 8
Middle slope	55.5	0.0	+ 4.0	1.42	−0.10	− 4.10	4.0	+0.6	63	+ 4
Southern slope	62.7	+0.3	+15.4	2.24	+0.40	− 4.00	3.0	−1.6	64	+ 1
Southern Plateau	57.5	−2.3	− 3.4	1.06	+0.50	+ 1.50	2.3	0.0	52	+10
Middle Plateau	47.5	−3.3	− 5.8	1.78	+1.00	+ 1.20	3.2	−0.1	58	+ 9
Northern Plateau	47.9	−1.6	−16.5	0.66	−0.90	+ 0.80	3.8	−0.8	55	− 8
North Pacific	50.0	−1.7	− 7.7	1.81	−2.20	− 8.30	5.1	−1.2	78	− 2
Middle Pacific	55.1	−3.6	− 3.0	1.01	−0.60	− 0.10	4.7	+0.9	71	+ 1
South Pacific	59.0	−3.2	− 4.6	1.64	+0.80	+ 5.90	4.1	+1.0	76	+ 6

WEATHER CONDITIONS ON THE NORTH ATLANTIC DURING OCTOBER, 1915.

The data presented are for October, 1915, and comparison and study of the same should be in connection with those appearing in the REVIEW for that month.

Chart IX (XLIV—133) shows for October, 1915, the averages of pressure, temperature, and the prevailing direction of the wind at 7 a. m., 75th Meridian time (Greenwich Mean Noon), together with the locations and courses of the more severe storms of the month.

PRESSURE.

The distribution of the average pressure for the month, as shown on Chart IX, differed but slightly from the normal over the greater part of the ocean, although unusual conditions existed in the region shown in the extreme northeastern part of the chart. The Azores HIGH was practically normal as to extent and position, and slightly above in intensity, while the Continental HIGH

with a crest of 30.19 inches was central in eastern Kentucky, extending as far east as the 75th Meridian. The Icelandic LOW of 29.65 inches was well developed and somewhat south of its normal position, the approximate center being near latitude 62°, longitude 28°.

The most unusual feature of the monthly distribution was the high-pressure area, with a crest of 30.24 inches, central near Christiania, Norway, where the normal for the month is about 29.80 inches. The steep gradient between this HIGH and the Icelandic LOW was responsible for the unusually large number of days on which winds of gale force were reported from the region between these two areas. In the 5-degree square that includes the crest of the HIGH just referred to, the variation in pressure from day to day was comparatively small, the pressure ranging from 29.90 inches on the 1st, to 30.58 inches on the 19th. On every day during this period readings were above the monthly normal, and on only two days did they fall below 30 inches.

In the territory covered by the Icelandic LOW the conditions were reversed, as the fluctuations in the pressure readings during the month were marked, the extreme pressures were 28.80 inches on the 13th, 30.30 inches on the 25th. In this square the pressure was considerably below the monthly mean from the 11th to the 17th, and on the 27th and 28th, while it was above the average on the 19th, 20th, 25th, and 26th, the departures being small during the remainder of the month. In the waters adjacent to the European coast high pressure prevailed between the 3d and 6th, and on the 17th and 19th, while it was low on the 10th, 11th, 28th, and 31st. Off the American coast the highest barometric readings were recorded on the 11th and 12th, and the lowest on the 2d; the readings, as a rule, were uniformly high, and the variations from day to day small.

GALES.

Under normal conditions there is a considerable increase in the number of gales in October as compared with September. For October, 1915, the number reported between the 45th and 55th parallels and the 10th and 25th meridians, was considerably above the normal for the month. In the 5-degree square between latitude 50°–55°, longitude 20°–25°, they were reported on 9 days, a percentage of 29, the normal for that square being 19. In the middle portion of the northern steamer routes, the percentage ranged from 10 to 19, which in some localities was slightly above the normal, and in others below. The waters along the American coast were remarkably free from heavy winds, the same conditions holding true in the Caribbean Sea and Gulf of Mexico.

On Chart III, tracks of centers of low areas, October, 1915 (XLIII–117), a LOW (1 on Chart IX) is shown that on the morning of the 1st was near Charlotte, N. C. This moved rapidly in a northeasterly direction and on the evening of the same day was a short distance east of Norfolk. It decreased somewhat in its rate of movement and on the morning of the 2d was central about 100 miles east of Cape May; the winds were from moderate to fresh, with a minimum barometer reading of 29.68 inches. The LOW then moved in a due easterly direction and on the morning of the 3d was near latitude 40°, longitude 64°, the general conditions having changed but little since the previous day. Continuing in its easterly course with an increased rate of movement, the disturbance reached a point near latitude 40°, longitude 51°, on the 4th. While the barometer readings remained practically unchanged, the winds had increased somewhat in velocity, a number of vessels reporting gales of from 40 to 48 miles an hour. This LOW then turned toward the southeast and, diminishing somewhat in speed, was central on the 5th near latitude 36°, longitude 45°; the barometer had risen slightly since the 4th, although gales were reported in the northwest quadrant. There was a HIGH of 30.10 inches on this day, with its center near Halifax, and the steep gradient between the two areas caused heavy winds in the intermediate territory. While traces of the LOW could be seen on the 6th, it was fast filling in, light to moderate winds prevailing. On October 6 there was a well-developed LOW of 29.50 inches central near latitude 48°, longitude 26°, that was accompanied by moderate to fresh winds, while fog was encountered near the center. This moved in a northeasterly direction, and on the 7th the approximate center was near latitude 57°, longitude 16° W., although the area had increased so in extent and so few observations were received that it was difficult to plot its location accurately. The barometer had risen slightly since the day before, and the force of the wind remained about stationary, except that one vessel off the south coast of Ireland reported a southerly gale of 40 miles an hour.

From the 8th to the 12th the LOW was apparently stationary in the vicinity of Iceland, although its position was indeterminate on account of the lack of observations. On October 11 there was a LOW of 29.51 inches (11 on Chart IX) central about 100 miles southeast of Saint Johns, N. F. Moderate winds, with thick fog, prevailed near the center, while in the southwest quadrant of the area gales of from 40 to 55 miles were reported. On the same day a HIGH with a crest of 30.20 inches was located a short distance west of the Azores, and winds of gale force prevailed in the region between the two areas. The LOW area moved in a northeasterly direction, and on the 12th the center was near latitude 48°, longitude 39°; the barometer had fallen to 28.96 inches, and the winds increased in violence, as gales of from 50 to 70 miles an hour prevailed over a large portion of the territory between the 40th and 52d parallels and the 35th and 48th meridians, while hail was reported by two vessels.

The course of the storm curved slightly toward the north, and on the 13th the center was near latitude 48°, longitude 23°; the barometer had fallen to 28.60 inches, and the force of the wind and extent of the storm area had apparently changed but little since the previous day. From the 14th to the 17th there were indications of a LOW in the vicinity of Iceland, although its position could not be determined accurately on account of the few observations received from that vicinity. On the 18th there was a disturbance, with the lowest barometer reading of 29.14 inches at latitude 55°, longitude 44°. Strong gales were encountered to the eastward and southward of this point, and one vessel at latitude 55°, longitude 35°, reported a southerly gale with a maximum force of 75 miles an hour. While the storm area was somewhat larger than on the day before, there was quite a variation in the wind velocities as reported from different vessels in that region, as they ranged from 23 to 75 miles an hour.

This disturbance moved in an easterly direction and on the 19th was central near latitude 53°, longitude 30°; the barometer had risen to 29.60 inches, and the maximum wind velocity, as recorded by three vessels near the 30th Meridian and between the 47th and 57th parallels, was 48 miles an hour. From the 20th to the 22d this LOW remained nearly stationary, the winds decreasing in

force, and by the 23d only faint traces of it were observed, On the 24th there was a well-defined area of low pressure off the south coast of Newfoundland with a minimum barometer reading of 29.34 inches, and moderate winds. This moved toward the northeast, apparently decreasing in intensity, and by the 25th the approximate center was near latitude 55°, longitude 45°: one vessel reported a westerly gale of 48 miles, although there were too few observations in the vicinity to determine the conditions accurately. On October 27 a LOW of 29.24 inches was located near latitude 59°, longitude 19°, and on the same day a HIGH with a crest of 30.61 inches existed off the Canadian coast near the 50th Meridian. No heavy winds were encountered near the center of the LOW, but in the territory between the two areas, near the 49th parallel and the 27th Meridian, three vessels reported northwesterly gales of 48 miles an hour, while the barometer readings ranged from 29.94 inches to 30.20 inches. On the 28th the center of the LOW had remained practically stationary and of the same intensity, but had increased somewhat in extent. The HIGH was on that date a short distance northwest of the Azores, the barometer reading at the crest having fallen to 30.50 inches. As on the previous day most of the heavy winds reported occurred about midway between the two areas, where northwest gales of from 40 to 55 miles prevailed.

During the 29th and 30th there was not a great deal of change in the relation of the HIGH and LOW as compared with the 28th, although on the 30th the LOW was about 5° south of its former position, and was accompanied by westerly and northwesterly gales of from 40 to 65 miles an hour, while fog prevailed near its center. This LOW then moved rapidly toward the southeast, and on the 31st was central near Brest, France, where the barometer reading was 29.27 inches. Strong northwest gales still prevailed between the French coast and the 22d Meridian, and the storm area remained about the same in extent as on the previous day.

On the 30th a second LOW of 29.42 inches covered a large portion of the Province of Quebec. While this depression was very definite in outline, it was accompanied only by light and moderate winds, and fog prevailed in its eastern portion. This LOW moved toward the east, and on the 31st was central near the intersection of the 50th parallel and 60th Meridian, the barometer having fallen to 28.98 inches. One vessel, about 200 miles southwest of the center, encountered a northwest gale of over 50 miles an hour, and another ship as far south as latitude 36° had the same experience, while moderate winds, and fog, were reported from the territory between.

TEMPERATURE.

The average monthly temperature of the air over the ocean was as a whole, slightly lower than usual. South of the 50th parallel the departures ranged from 0° to −3°, while north of that parallel and in the waters adjacent to the European coast they were slightly positive. While the temperature over the western part of the ocean and Gulf of Mexico was slightly below the normal, it rose as the shore was approached, as positive departures prevailed for the most part at a number of Canadian and United States Weather Bureau stations on the Atlantic and Gulf coasts, as shown by the following table:

	°F.		°F.
St. Johns, N. F.	+0.6	Washington, D. C.	+2.0
Sydney, C. B. I.	+3.2	Norfolk, Va.	+3.1
Halifax, N. S.	+2.8	Hatteras, N. C.	+2.4
Eastport, Me.	+2.0	Charleston, S. C.	+3.7
Portland, Me.	+2.1	Key West, Fla.	+2.2
Boston, Mass.	+3.4	Tampa, Fla.	+4.2
Nantucket, Mass.	+0.3	New Orleans, La.	+3.9
Block Island, R. I.	−0.1	Galveston, Tex.	+1.8
New York, N. Y.	+1.1	Corpus Christi, Tex.	+1.9

The lowest temperature recorded during the month was 35°, and occurred on the 25th in the 5-degree square between the 50th and 55th parallels and the 55th and 60th Meridians, while the highest temperature for the same square was 49° on the 9th and again on the 14th.

FOG.

During the period from 1901 to 1906 for the month of October the average percentage of days with fog off the banks of Newfoundland was 30, while in the same region for October, 1916, it was observed on 7 days, a percentage of 23. In the vicinity of Cape Cod and Nantucket the amount was considerably below the normal, while over the central part of the northern steamer routes it was slightly above.

PRECIPITATION.

Hail was observed in mid-ocean on the 12th, 18th, and 28th, and on the last date it was also reported off the Irish coast. No snow was reported during the month.

Maximum wind velocities, October, 1916.

[Velocities below 50 *mi/hour* (22.4 *m/sec.*) are not included here.]

Stations.	Date.	Velocity.	Direction.	Stations.	Date.	Velocity.	Direction.
		Mi/hr.				*Mi/hr.*	
Alpena, Mich.	16	52	nw.	New York, N. Y.	17	63	nw.
Block Island, R.I.	14	56	nw.	Do.	19	60	s.
Do.	17	57	nw.	North Head, Wash.	28	72	se.
Buffalo, N. Y.	13	68	sw.	Do.	29	72	s.
Do.	16	68	sw.	Do.	30	70	s.
Do.	17	66	w.	Pensacola, Fla.	18	120	w.
Do.	20	61	w.	Point Reyes Light, Cal.	2	54	nw.
Do.	21	61	sw.	Do.	27	56	nw.
Do.	25	70	w.	Portland, Me.	13	54	nw.
Do.	26	66	w.	Do.	14	63	nw.
Do.	27	50	w.	Do.	17	62	sw.
Canton, N.Y.	17	54	w.	Do.	19	62	se.
Cheyenne, Wyo.	1	53	w.	Do.	20	56	se.
Detroit, Mich.	20	54	sw.	Providence, R. I.	17	60	nw.
Do.	25	52	sw.	Saint Paul, Minn.	16	52	nw.
Duluth, Mich.	16	54	nw.	Sandy Hook, N.J.	19	54	s.
Erie, Pa.	19	61	se.	Do.	20	50	s.
Green Bay, Wis.	16	52	nw.	San Juan, P. R.	9	52	n.
Louisville, Ky.	20	50	sw.	Seattle, Wash.	29	51	s.
Lynchburg, Va.	18	63	ne.	Syracuse, N. Y.	17	50	nw.
Mobile, Ala.	18	115	e.	Tatoosh Island, Wash.	28	76	s.
Mount Tamalpais, Cal.	2	57	nw.	Do.	30	74	s.
Do.	3	56	nw.	Do.	31	54	sw.
Do.	27	50	nw.	Toledo, Ohio.	20	60	nw.
Do.	28	54	nw.	Do.	25	54	sw.
Do.	30	51	nw.				
New York, N. Y.	9	51	nw.				
Do.	14	58	nw.				